[10537/290]

MOTOR VEHICLE STEERING COLUMN

The invention relates to a motor vehicle steering column with a bracket fixed to the vehicle and a steering column tube in accordance with the precharacterizing clause of patent claim 1.

DE 196 41 152 A1 discloses a motor vehicle steering column, in which a steering column tube can be adjusted in inclination relative to a bracket fixed to the vehicle via an adjusting device. The adjusting device comprises a lever which is mounted pivotably on the bracket and can be deflected about a pivot axis by means of a driving device -- here an electric motor. The driving device drives a drive spindle on which a spindle nut is seated. The forward movement of the spindle nut causes the lever to be deflected on the bracket about a pivot axis, so that the steering column tube which is connected to the lever is carried along upward or downward.

This solution has the drawback that, for relatively large adjustments, the lever length has to be correspondingly enlarged. However, it is precisely in the cockpit region that the construction space available is not as desired.

It is therefore the object of the invention to provide a motor vehicle steering column which permits a maximum inclination setting irrespective of the available construction space.

This object is achieved according to the invention by the features of patent claim 1.

According to the invention, an adjusting device for the inclination setting of a steering column tube is provided, which device comprises a lever which is mounted pivotably on a

bracket fixed to the vehicle and to the output end of which is coupled a deflecting clamp. The deflecting clamp is connected pivotably to the steering column tube, so that, when the lever is deflected, the deflecting clamp and therefore the steering column tube are carried along. The transmission ration between the lever and deflecting clamp is designed in such a manner that a small deflection of the lever causes a large adjustment of the deflecting clamp. Depending on the arrangement of the pivot axis of the lever and of the deflecting clamp, the adjustment of the steering column can be selected freely without having an increased need for construction space.

Advantageous refinements emerge from the subclaims.

In one preferred embodiment, the steering column tube can be mounted on the bracket in a manner such that it can be moved on a pivot axis extending transversely with respect to the longitudinal axis of the motor vehicle steering column. This pivot axis forms the pivot point of the motor vehicle steering column during the inclination setting. That is to say, the further away the pivot axis is arranged from the steering wheel, the greater the adjustments which can be achieved for the steering wheel by means of small adjustments of the adjusting device.

In addition to an inclination setting, the steering column tube may also be held in a manner such that it can be set in length. For this purpose, two steering column sections which can be displaced one inside the other are provided, with, below the longitudinal axis of the motor vehicle steering column, a flange being integrally formed on the outer steering column tube section. The integrally formed flange has a pivot axis of the deflecting clamp passing through it. The adjustment during the inclination setting can be determined as

a function of the position of the pivot axis. The closer the pivot axis of the deflecting clamp is to the pivot axis of the lever, which axis is fixed on the vehicle, the greater the adjustments which are possible.

The deflecting clamp can have an essentially U-shaped design guided around the outer steering column tube section below. The free limb ends of the deflecting clamp can be coupled to the output end of the lever. This improves the stiffness of the entire system.

The lever can have an essentially triangular longitudinal section form, so that the driving end is formed by a point of the triangle and the output end by another point of the triangle. The limb lengths of the triangular lever determine the lever ratios of the adjusting device.

The lever may be designed mirror-symmetrically with respect to the longitudinal axis of the motor vehicle steering column, so that precise height setting without a lateral offset is possible.

Two exemplary embodiments are explained below with reference to the drawing, in which:

Fig. 1 shows a motor vehicle steering column in a first embodiment in a perspective view,

Fig. 2 shows the motor vehicle steering column as shown in Fig. 1 in a view from the side, and

Fig. 3 shows a motor vehicle steering column in a second embodiment.

Fig. 1 illustrates a motor vehicle steering column 1 with a two-part, telescopic steering column tube 2, in which a steering spindle 3 is rotatably mounted. The steering column tube 2 is connected to a bracket (not illustrated) which is fixed to the vehicle.

The steering column tube 2 is composed of an inner steering column tube section 4 and an outer steering column tube section 5. The inner steering column tube section 4 is connected to a threaded spindle 6 which is driven by an electric motor 7. Depending on the direction of rotation of the threaded spindle 6, the inner steering column tube section 4 is moved into or out of the outer steering column tube section 5 in accordance with the arrow direction A, so that the motor vehicle steering column 1 is set comfortably in the longitudinal direction.

A second electric motor 8 is fastened to a mount 9 on the outer steering column tube section 5. The outside of the mount 9 has two axle stubs 10 which together form a pivot axis 11. The axle stubs 10 are mounted pivotably in receptacles of the bracket.

A second threaded spindle 12 is driven by the electric motor 8, so that -- depending on the direction of rotation of the threaded spindle 12 -- a spindle nut 13 sitting on the threaded spindle 12 is moved to and fro in accordance with the arrow direction B.

The spindle nut 13 belongs to an adjusting device 14 via which the steering column tube 2 is held in such a manner that it can be adjusted in inclination relative to the bracket fixed to the vehicle.

The adjusting device 14 comprises a lever 15 and a deflecting clamp 16. The lever 15 has a driving end 17 and an output end 18.

The driving end 17 is fastened pivotably to the spindle nut 13, so that the lever 15 can execute a pivoting movement in accordance with arrow direction C about a pivot axis 19. From the driving end 17, the lever 15 extends in an angular manner to the output end 18 to which the deflecting clamp 16 is coupled via a pivot axis 20, so that the deflecting clamp 16 can be moved about the pivot axis 20 in accordance with arrow direction D.

The lever 15 is provided with bearing journals 21 which are mounted in corresponding receptacles of the bracket and therefore form a pivot axis 22 about which the lever 15 can be pivoted in accordance with arrow direction E.

At its end 23 lying opposite the pivot axis 20, the deflecting clamp 16 coupled to the output end 18 of the lever 15 is mounted pivotably on a flange 24 of the outer steering column tube section 5, so that a movement of the deflecting clamp 16 about a pivot axis 25 in accordance with arrow direction F is possible.

Fig. 2 illustrates the motor vehicle steering column 1 (which is illustrated perspectively in Fig. 1) in a view from the side. In addition to the motor vehicle steering column 1, a bracket 26 which is fixed to the vehicle is indicated.

The motor vehicle steering column 1 is mounted on the bracket 26 via a clip 28 (illustrated schematically) in such a manner that the motor vehicle column 1 can move in a circular path in accordance with arrow direction G about a pivot axis 27 extending transversely with respect to the longitudinal axis L

of the motor vehicle steering column 1. The movement of the motor vehicle steering column 1 along the arrow direction G is realized by means of the adjusting device 14 and offers the occupant the possibility of undertaking an inclination setting of the steering wheel.

The inclination adjustment by means of the adjusting device 14 takes place as follows:

starting from that position of the motor vehicle steering column 1 which is indicated in Fig. 2 by a solid line, the electric motor 8 is activated by the driver, so that the threaded spindle 12 rotates. As a result, the spindle nut 13 sitting on the threaded spindle 12 is moved in the arrow direction B into the position illustrated by chain-dotted lines and the lever 15 is therefore deflected about its pivot axis 22 in accordance with arrow direction E. During its movement, the output end 18 of the lever 15 carries along the deflecting clamp 16, with the result that the latter rotates about the pivot axis 25 in accordance with arrow direction F and, in the process, moves the motor vehicle steering column 1 upward in arrow direction G. This movement takes place on a circular path about the pivot axis 27 of the motor vehicle steering column 1.

During an opposed movement of the spindle nut 13, the movements of the adjusting device 14 run correspondingly in reverse.

That movement of the spindle nut 13 which runs on a circular path about the pivot axis 22 is compensated for by the pivotable mounting of the electric motor 8 or mount 9 permitting a pivoting movement of the threaded spindle 12 about the pivot axis 11. However, this compensation may also

be achieved by a slotted-guide mechanism or a flexible threaded spindle.

Fig. 3 shows a second embodiment of the invention, with the same reference numbers as in Figs. 1 and 2 being used. Components which differ from the embodiment according to Figs. 1 and 2 are indicated by an apostrophe.

In the case of the second embodiment of the invention as shown in Fig. 3, the adjusting device 14' comprises a lever 15', the pivot axis 22' of which, in contrast to the embodiment according to Figs. 1 and 2, is shifted forward in the direction of the steering wheel. This has the advantage inter alia that, in the event of a crash, the forces introduced into the steering column cause a tensile stress in the threaded spindle 12.

The inclination setting by means of the adjusting device 14' takes place as follows:

The threaded spindle 12 is driven by the electric motor 8, so that the spindle nut 13 moves on the threaded spindle 12 in accordance with arrow direction B. The lever 15' is deflected about the pivot axis 22' in accordance with arrow E', as a result of which the pivot axis 20' is correspondingly shifted downward. The deflecting clamp 16 is pivoted about the pivot axis 25' in accordance with arrow direction F', so that the motor vehicle steering column 1 moves downward on a circular path about the pivot axis 27 in accordance with arrow direction G'.

In the case of a movement of the spindle nut 13 in the opposite direction, the sequence of movement of the adjusting device 14' takes place in the reverse direction.

In this embodiment too, the movement of the spindle nut 13 can be compensated for by the pivotable mounting of the electric motor 8 or the mount 9.